Africa RISING

Technology Brief Compilation Template

**Contour bunding associated with fast growing tree species**

Why the technology is important

Water is one of the main constraint to crop production as it directly influences plants, this is why it is very important to minimize rain water loss by runoff in rainfed agriculture. In low inputs agriculture systems in the semi-arid zones of Mali, the development of water conservation techniques is essential to ensure sustainability of farming systems. Therefore, contour bunding (CB) technology was developed to reduce runoff and consequently increase rainfall capture, water storage***,*** deep infiltration and yields of cereals and legumes. Reinforcing the bund with nitrogen-fixing trees such as *Gliricidia sepium* and *Leucaena leucocephala* improves soil fertility by retaining important nutrients of the soil through chemical elements recycling (litter decomposition, roots exudates, nutrients trapped by trees canopies etc.). The trees species, also provide quality forage for livestock.

## Description of the technology

The technology is implemented at the field scale and can be extended to cover the entire watershed or household farming community. Spirit level, water level or “A” frame can be used to mark the contour lines. Once contour lines are marked contour bunds are constructed at a width of 100 cm and 20 to 30 cm height. Then, ridging and other field operations (sowing, weeding etc.) follow the shape of the contour lines and furrow lines become water infiltration areas. Required equipment and human resources necessary to implement the CB are as follows: see also photo 1.

1. A technician using a spirit level or a farmer with a water level or “A” frame metered rod
2. About 50 stakes ha-1 to demarcate the contour lines
3. Farmer or farmer-based organization with draft animals

Four steps are involved in constructing contour bunds.

1. **Diagnosis:** A joint survey including farmer and field technician (extension agent) was done to understand slopes in the field, the general movement of rain water in the landscape, farmer’s practices and their experiences, relationship between neighboring farmers to avoid conflicts of water drainage and creation of synergies for collaboration.
2. **Marking contour lines:** This operation is done by the field technician when using the spirit level or farmers by water level or “A” frame metered rod.



Water level

“A” frame

Sprit level

Photo 1: Equipment required to construct contour bunds

1. **Construction of the CB:** Generally, it’s done by farmers using an ox-drawn plow when available or hoe if not. Three or four passes by the plow are enough to create bund visibility in the landscape compared to the normal ridges (one pass of the plow) (photo 2). To reinforce and stabilize the CB, fast growing trees species (previously grown in nursery for about 30 days) are planted on its crest at a distance of 3 meters. The standard distance between CB is 50 meters if the slope is gentle (<1.6 %). In case of steep slopes (> 1.6 %), the distance between bunds can be narrower to 20 -30 meters with an elevation of 80 cm.
2. **Maintenance of the CB:** Maintenance of the CB is generally done using animal traction or hoe to strengthen and sustain it periodically. The structure gets its strength with time.



Photo 2: Constructed contour bund in M’Pessoba village, southern Mali

## Photo of the technology



Photo 3: One year old (*Acacia colei* and *Gliricidia sepium*) planted on the crest of a contour bund, in the technology park of Flola.

## Benefits of the technology

**Environmental domain: Effect of the technology on runoff, soil erosion and soil quality**

Mean runoff rate in a farm with and without CB in Flola and Mpéssoba technology park is shown in Figure 1.It appears that, mean runoff rates were 22 % in the CB plot and 40 % in the farmer’s practice**.** In rainfed agriculture, this difference is great since it reaches 100 mm year-1 on a mean rainfall of 900 mm**.**

**Fig.1:** Runoff rate in technology parks at Flola and Mpessoba in 2015 and 2016

Environment conditions have been improved by planting fast growing trees species in the crest of contour bunding. At the end of the rainy season, at least 100 kg of above ground dry biomass (carbon sequestration) was produced on each of the contour bunds which cover an area of 100 m2.

Mean sediments losses were 12 t ha-1 in the CB plots and 35 t ha-1 in the plot under farmer’s practice (figure 2).

**Fig.2:** Sediments losses in technology parks at Flola and Mpessoba, Southern Mali, in 2015

* **Productivity domain: Effect of the technology on crop yield**

The grain yields of sorghum alone with CB doubled those of NCB. For cowpea, the grain yield increase was 81% by the use of CB (figure 3).

Figure 3 showed also, the evidence of using CB to improve yields of the main staple cereal crop (maize) and peanut which was the principal cultivated legume in the area.

**Fig.3**: Cereals and legumes grain yields with (CB) and without (NCB) in a technology park, Flola, southern Mali

* **Social domain: Gender equity, social cohesion at household level**

Cohesion among members of the household is enhanced through agreement for planting trees in the fields which belong to all the family members. Trees species and sites as far as planting and maintenance have been discussed.

* **Livelihoods**

Improving yield will lead to changes in farmer’s daily live (food, tools, media)

## How to get started/implement the technology

Collaborative farmers have to get in touch with local NGOs, namely AMEDD which offer the service by charging 5000 FCFA (~ 9 US$) per hectare. Our experience in the past showed that farmers are willing to pay the service charge. Other strategy can be through farmers-based organization (technical team) which have been trained by researchers and NGOs on the technology.

## Opportunities for application of technology

Opportunities to widely use the CB can be through USAID Mali scaling projects for example ARDT-SMS. Also, the technology can be proposed to other CGIAR centers and NGOs for wide demonstration and adoption.

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